TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING
ECV 4212 & TMC 4214 : FLUID MECHANICS I

END OF SEMESTER EXAMINATION
SERIES: JANUARY 2025
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of **four** questions.
Attempt **question ONE (Compulsory) and any other TWO questions**.
Do not write on the question paper.

QUESTION ONE

a) Define the following terms;

(i) Define Pascal's law.

(ii) What is the difference between laminar and turbulent flow. **(6 marks)**

b) Calculate the following given 2 litres of petrol of specific gravity = 0.7.

(i) Density
(ii) Specific weight
(iii) Weight **(6 marks)**

c) Differentiate between ideal and real fluids. (4 marks)

d) A hydraulic press has a ram of 30 cm diameter and a plunger of 4.5 cm diameter. Determine the weight lifted by the hydraulic press when the force applied at the plunger is 500 N. **(4 marks)**

QUESTION TWO

a) Briefly explain how a venturi meter works. **(4 marks)**

b) Water is flowing through a tapering pipe having diameters 300 mm and 150 mm at sections 1 and 2 respectively. The discharge through the pipe is 40 litres/sec. section 1 is 10 m above the datum and section 2 is 6 m above datum. Determine the intensity of pressure at section 2 if at section 1 is 400 kN/m^2. **(6 marks)**

c) Water stands at a depth H in a large, open tank whose side walls are vertical. A hole is made in one of the walls at a depth h below the water surface. What is the distance R from the foot of the wall does the emerging stream strike the floor? **(10 marks)**

QUESTION THREE

a) A pipe 200 m long slopes down at 1 in 100 and tapers from 600 mm diameter at the higher end to 300 mm diameter at the lower end and carries 100 litres/sec of oil (sp. Gravity 0.8). if the pressure gauge at the higher end reads 60 kN/m^2. Neglect all losses. Determine

   i) Velocities at the two ends
   ii) Pressure at the lower end. **(6 marks)**

b) Water stands at a depth H in a large, open tank whose side walls are vertical. A hole is made in one of the walls at a depth h below the water surface. What is the distance R from the foot of the wall does the emerging stream strike the floor? **(10 marks)**

c) At what depth below the surface of oil, relative density 0.8, will produce a pressure of 120 kN/m^2? What depth of water is this equivalent to? **(4 marks)**

QUESTION FOUR

a) Water flows through a pipe with diameters of 20cm and 10cm at sections A and B, respectively. The rate of flow through pipe is 35 litres/sec. The section A is 6m above datum and section B is 4m above the datum. If the pressure at section A is 6m above datum and section B is 4m above the datum. If the pressure at section A is 39.24 N/cm^2. Determine the intensity of pressure at section B. **(10 marks)**

b) Calculate Reynolds number and classify the type of flow, if a fluid having viscosity of 0.4 Ns/m^2 and relative density of 900 Kg/m^3 flows through a pipe of 20 mm with a velocity of 2.5 m/s. **(4 marks)**

c) A fluid with a density of 1,000kg/m^3 is flowing through a pipe with a diameter of 0.1 m at a velocity of 2 m/s. The fluid has a viscosity of 0.001 Pa.s. Determine the Reynolds number for this flow? **(4 marks)**

d) Briefly explain importance of Reynold's number. **(2 marks)**

QUESTION FIVE

a) Derive Bernoulli equation. **(8 marks)**

b) State the FOUR assumptions made in Bernoulli equation. **(4 marks)**

c) An oil of Specific gravity 0.8 is flowing through a pipe. A differential manometer is connected at the two points, points A and B, and shows a difference in the Mercury level as 20 cm. Determine the difference between the pressure at the two points. (take density of Mercury = 13600 kg/m3 and g = 10 m/s^2). **(8 marks)**